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Modelling and Forecasting UK Public Finances

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Abstract

In this paper, we present a new model of UK public finances which aims to shed light on recent problems of forecasting the PSBR. The main elements of public spending are treated as endogenous variables which rise in line with GDP over the medium term. Also, the cyclical response of public borrowing to rises in the level of economic activity is more muted when growth is export-led than when it is consumer-led. These two features go a long way towards explaining the rapid deterioration of public finances in the early 1990s and the slow pace of improvement since 1993.

JEL classification: C53, E62, H62.

I. INTRODUCTION

A medium-term approach to fiscal policy has been a major theme of UK government policy since 1979. The Conservative government that came to power in that year launched a Medium-Term Financial Strategy (MTFS), the objective of which was to reduce both inflation and the public sector deficit. In the original formulation of the MTFS, these objectives were directly linked, with the reduction in the contribution to monetary growth from public borrowing identified as a key mechanism through which inflation would be curtailed. As the 1980s progressed, the government's faith in this mechanistic link between the public sector borrowing requirement (PSBR), the money supply and inflation faded. However,

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the emphasis on setting prudent medium-term objectives for government borrowing continued because of the belief that a sound fiscal position underpinned the financial stability of the economy more generally. This approach has carried through from the Conservatives to the new Labour administration.

This medium-term approach to fiscal policy is inevitably reliant on forecasts of public borrowing. There are two reasons for this. First, forecasts or projections are necessary to show the impact of current fiscal plans for the path of public borrowing in future years. Projections of the PSBR — or another measure of the government deficit — are needed to show that tax reductions (or public spending increases) are consistent with a prudent level of public borrowing or to justify tax rises (or spending restraint).

Second, the level of public borrowing is very sensitive to the state of the cycle. Government expenditure is pushed up by recessions, whereas tax receipts fall, causing the deficit to rise in periods when economic activity is weak and fall when the economy is growing strongly. For example, recent estimates by the Treasury suggest that the PSBR/GDP ratio will fall/rise by around 0.8 percentage point for every 1 percentage point by which output growth is above/below trend (Virley and Hirst, 1995). The current level of public borrowing will therefore flatter the underlying position close to the peak of the cycle while presenting too pessimistic a picture when the economy is in recession. A projection of public borrowing in future years therefore provides a picture of how the fiscal position will look as the state of the economy returns to a more neutral cyclical position.

Large errors in forecasting public finances in the late 1980s and 1990s have put the spotlight on the techniques that the Treasury and independent forecasters have used to generate their projections of public borrowing. A recent analysis by Treasury economists (HM Treasury, 1997a) showed that the average absolute error for official projections of public borrowing was nearly 2 per cent of GDP for a two-years-ahead forecast and nearly 4 per cent for four years ahead.[1] These errors contributed to the loss of control over public borrowing which saw the PSBR explode from broad balance in 1990–91 to over £45 billion (7.1 per cent of GDP) in 1993–94. Forecasters were also surprised by the slow pace of improvement of public finances in the early years of the recovery of the 1990s, despite significant tax rises in 1994 and 1995.

Some of these errors reflected the fact that the recession of the early 1990s was much longer and deeper than forecasters expected. However, this is only part of the story, accounting for only half of official PSBR forecast errors in the late 1980s and the 1990s.[2] In this paper, we present a new model of UK public finances which aims to capture more satisfactorily how public finances respond to

[1]Slightly different figures are given in Table 1 of Pike and Savage (1998, this issue) because a different time period for comparison is used.

[2]According to Table 1 in HM Treasury (1997a), the average absolute error for three- to four-year forecasts of the PSBR between 1985 and 1996 was 3.3 per cent. Adjusted for GDP forecasting errors, the average discrepancy is still 1.7 per cent.

changes in the level of economic activity. This model has been developed as part of the re-estimation and respecification of the London Business School (LBS) macroeconomic model of the UK economy.[3] A key feature of this model is that it treats the main elements of public spending (current spending on goods and services and transfers to the personal sector) as endogenous variables which rise in line with — though not faster than — GDP over the medium term. The model also produces a very different cyclical response of public borrowing to rises in the level of economic activity when growth is export-led from when it is consumer-led. These two features go a long way towards explaining the rapid deterioration of public finances in the early 1990s and the slow pace of improvement since 1993.

Section II sets out the structure of the model and the main equations that underpin it. Section III discusses how adequately it explains the forecasting errors of the late 1980s and 1990s. Section IV looks at what the model suggests about the current outlook for public finances and contrasts this with the latest official projections.

II. MODELLING PUBLIC FINANCES

There are three ways in which the process of economic growth affects public finances and influences the level of government borrowing. First, a higher level of economic activity increases the tax base and therefore generates a stronger stream of revenues. Second, spending on social security benefits fluctuates with the level of unemployment. Government spending on unemployment and related benefits rises in recessions and drops back when the economy is booming. Third, the demand for public services will tend to rise as the economy grows over the medium term and real incomes increase. The first two of these mechanisms are crucial to understanding the performance of public finances over the cycle. But if we are to build a model of public finances that is to be used for medium-term projections, it is also important that we understand the third of these linkages: the relationship between the level of real income and public spending over the medium term.

One view of this relationship is that there is a persistent tendency of public spending to grow more rapidly than real incomes — which would imply a rising share of public spending in national income. As early as 1890, the German economist Wagner noted the tendency of public spending to rise faster than national output (Wagner, 1890) — subsequently described as 'Wagner's Law' — implying that the public spending share of GDP would rise over time. Wagner's analysis was based on the idea that, as society became more industrialised, the demands on the supporting infrastructure provided by the State would rise significantly, absorbing an increasingly large share of national income. A related

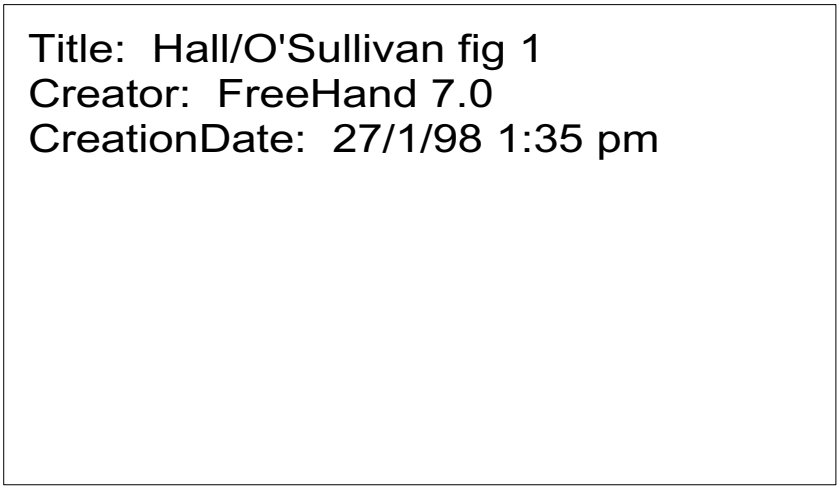
[3]See Allen and Hall (1996) for further details of this work. Hall, O'Sullivan and Sentance (1996) sets out in more detail the econometric analysis underlying the model set out in this paper.

idea is the notion that a number of key services provided by the public sector — in particular, health and education — are highly income-elastic. This tendency for public spending to rise faster than national income could also be reinforced by a 'relative price effect' due to slower productivity growth in service activities, where government spending is concentrated (see Baumol (1967)).

However, public spending cannot rise more rapidly than national income indefinitely. As public spending absorbs an increasing share of GDP, the tax burden needs to rise and/or public borrowing will increase. This, in turn, creates some resistance to further increases in the public spending share of national income. This resistance to higher taxes and increased public borrowing has been particularly noticeable in the UK since the mid-1970s, following the financial crisis of 1976 when the Labour government felt obliged to call on the support of the International Monetary Fund (IMF). Since the late 1970s, the upward trend in the public spending share of GDP has been arrested — as Figure 1 shows — and the dominant influence on the proportion of national output accounted for by government expenditure has been the state of the cycle. The boom of the late 1980s saw a sharp fall in the public spending share of GDP, followed by a sharp rise in the early 1990s as the economy moved into recession.

FIGURE 1

General Government Expenditure as a Percentage of GDP



Source: *UK National Accounts*, 1996 edition, Office for National Statistics.

1. Modelling Public Expenditure

In our modelling of public finances, we treat the mid-1970s as a watershed and our concern is to understand how public spending and taxation have been affected

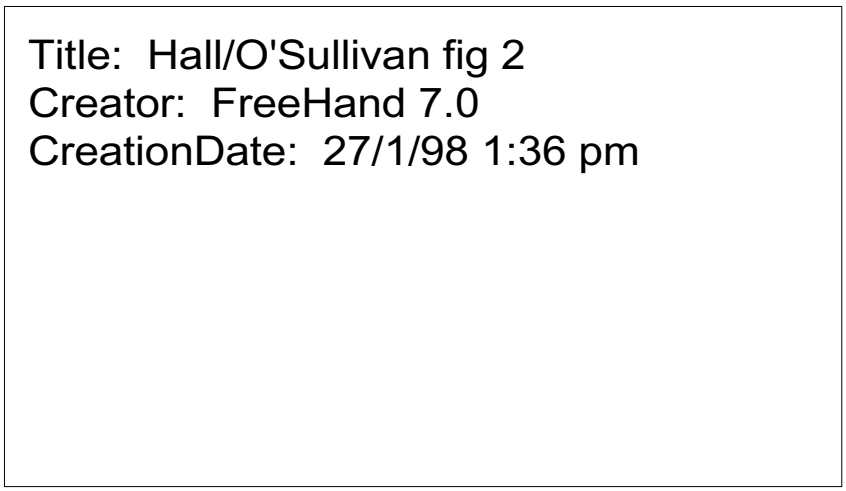
by economic growth over the last 20 years or so. Over this period, financing constraints have put a brake on the tendency of public spending to rise as a share of GDP. However, if we consider the two main items of current expenditure — government consumption of goods and services and grants to the personal sector (mainly social security payments) — there has been no tendency for public spending to fall as a share of GDP, as Figure 2 shows. Rather, the brunt of public spending restraint has fallen on capital expenditure, which has halved as a share of GDP since the early 1970s, dropping from around 5 per cent of GDP to 2½ per cent. Both main components of government current expenditure have fluctuated with the cycle. However, allowing for these fluctuations, expenditure on goods and services has been broadly stable as a share of GDP whereas social security continued to rise until the mid-1980s as unemployment continued to increase.

Our model of government expenditure, which is based on an econometric analysis of the main components of public spending over the last 20 years, has four key features which jointly explain this pattern:

1. Government current spending on goods and services is a constant share of GDP, fluctuating around this constant level with the state of the cycle, which is measured by the gap between the actual level of output and its trend value, based on a growth rate of just over 2 per cent.
2. Current grants and subsidies follow a similar pattern of behaviour but are also influenced directly by the level of unemployment and deviations between the

FIGURE 2

Components of Government Spending as a Percentage of GDP



Source: *UK National Accounts*, 1996 edition, Office for National Statistics.

headline measure of retail prices and an underlying measure of the price level (reflecting the fact that benefits are uprated in line with the headline retail price index (RPI)).

3. Social security spending is also pushed up from 1992 by special factors unrelated to unemployment. We interpret this as reflecting a relaxation in government spending which occurred around the time of the 1992 election and increased claims for disability and housing benefit.
4. At times of public spending restraint, it is capital spending that 'takes the strain' — both directly and through a reduction in the government contribution to the financing of investment by nationalised industries (Sentance, 1994). As the CBI has noted, 'When pressure is put on spending totals, capital spending can appear easiest to cut: few sewers will collapse if replacement is put off; buildings will not fall down; and roads will remain, albeit with growing potholes' (Confederation of British Industry, 1988). Asset sales, such as council house transfers and privatisation, can also help to reduce government spending. More recently, squeezing capital expenditure has involved shifting the financing of investment from the public to the private sector, through the Private Finance Initiative.

Technical details of this model are set out in the Appendix and in Hall, O'Sullivan and Sentance (1996). The model has satisfactory long-run properties, in that the share of current public expenditure in GDP will fluctuate with the cycle around a constant proportion which moves up and down with the equilibrium level of unemployment.[4] The model also passes the necessary econometric tests, in that it is based on a cointegrating relationship, which is a key requirement of a satisfactory time-series model (Engle and Granger, 1987; Hall, Cuthbertson and Taylor, 1992).

2. Modelling Tax Receipts

Turning to the revenue side of the account, our approach has the same objectives — the estimation of a simple model that fits the data well and that has sensible long-run properties. In the absence of tax avoidance, variations in the timing of tax payments due and complicated rules relating to tax allowances, modelling tax receipts would require only a simple accounting identity. Tax receipts would be equal to the tax rate multiplied by the tax base. The tax equations that underpin our model are based on this approach. However, our estimated equations also need to make some allowance for the multiplicity of tax rates and the complexity of the system of allowances.

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[4]The estimated equations presented in the Appendix show that a 1 percentage point rise in the equilibrium unemployment rate increases grants to the personal sector by 2.7 per cent — around £3 billion, or 0.4 per cent of GDP.

For each of the major taxes, we estimate an equation based on the following relationship:

$$T = qt(X - A)$$

where T = tax receipts, t is a measure of the tax rate, X is a measure of the tax base gross of allowances, A is a measure of the current value of allowances and q is a parameter reflecting economic influences on the structure of the tax system. If we estimate this equation in log form, we would expect there to be a unit coefficient on both the tax rate and the tax base net of allowances — allowing for timing effects.

Table 1 summarises the five main equations that form the basis of our model of public finances.[5] The equation determining VAT receipts is particularly interesting as it implies that the relationship between VAT payments and consumption varies with the strength of consumer spending relative to income (one minus the personal savings ratio, which measures the proportion of personal disposable income not consumed). Figure 3 illustrates this relationship, showing how the VAT receipts rose relative to nominal consumption in the late 1980s, as the savings ratio fell, and then dropped back again in the early 1990s, as consumption weakened.

TABLE 1

Modelling the Tax System

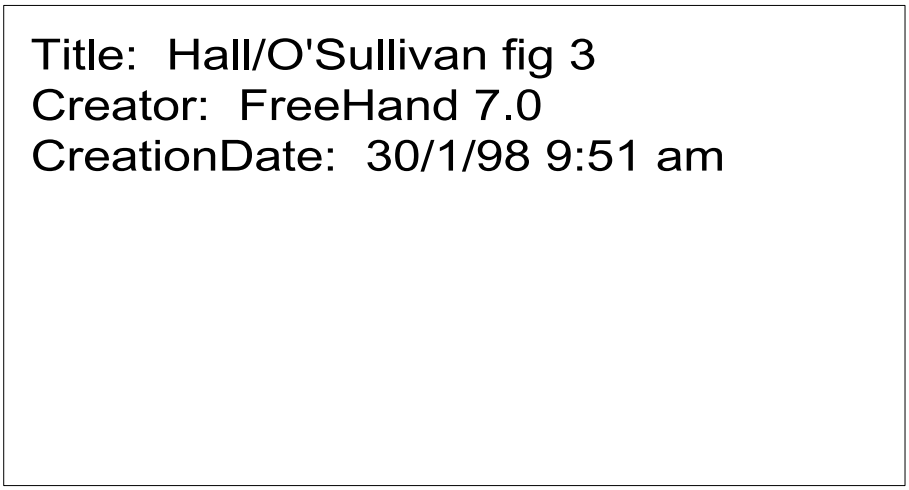
Tax	*Base*	*Allowances*	*Influences on q*
Corporation tax (mainstream)	Profits	Interest, capital allowances, dividends[a]	—
Income tax	Wages and salaries + other personal income	Employment × single person's tax allowance	—
VAT	Consumption	—	Savings ratio
National Insurance	Wages and salaries	—	Self-employment income as ratio of wage bill
Excise duties	Consumption	—	—

[a]Dividend payments are deducted from the tax base as we are modelling mainstream corporation tax receipts. Advance corporation tax (ACT) is included with personal income tax.

[5]Hall, O'Sullivan and Sentance (1996) gives details of the econometric analysis that underpins these equations.

FIGURE 3

VAT Receipts and the Savings Ratio



Source: Hall, O'Sullivan and Sentance, 1996.

One possible explanation of this pattern of behaviour is that the cyclical elements of consumer spending bear a disproportionate share of VAT, as food and other 'essentials' are zero-rated. More detailed work by the Treasury has challenged this view, arguing that 'little if any of the fall in the (underlying) VAT / consumer spending ratio looks to be attributable to shifts in the mix of spending' (HM Treasury, 1997b). Instead, Treasury economists attribute the weakness of VAT receipts in the 1990s to structural changes in the VAT system, including tax regime changes, successful legal challenges and the increased use of tax planning and tax avoidance. However, these findings can still be reconciled with our results if the effort that companies devote to legal challenges, tax planning and tax avoidance varies with the buoyancy of consumer spending — as the sharp increase in the erosion of the tax base in the early 1990s[6] and the bounce-back in VAT receipts in the wake of the recent recovery in consumer spending suggest.

Though our system of tax equations is very stylised, Table 2 shows that the implied revenue effects of tax changes are very similar to those set out in the IFS Green Budget (Institute for Fiscal Studies, 1995). The main exception is in the case of corporation tax (CT), where our equation focuses on explaining mainstream CT payments and therefore gives lower figures for the effects of tax rate changes. It is also worth noting that this is the least satisfactory of the

[6]Consumer spending fell by 2.2 per cent in 1991, its sharpest post-war annual fall.

TABLE 2

Tax Ready Reckoners, using Estimated Tax Equations: impact on revenues of 1 percentage point change

£ million

	London Business School		Green Budget (IFS, 1995)	
	1996–97	*1997–98*	*1996–97*	*1997–98*
Standard income tax rate	1,260	1,600	1,600	2,000
Corporation tax rate	200	420	630	940
VAT rate	1,950	2,680	2,540	2,675
Employers' NI	2,270	2,430	2,380	2,750
Employees' NI	2,270	2,430	1,875	2,155

equations we have estimated, though we are not alone in finding it difficult to account satisfactorily for changes in CT revenues.

To complete our model of public finances, a number of other equations need to be added. On the expenditure side, one important missing link is a model of debt interest, which embodies the accumulation of debt and links interest payments to other interest rates in the model. A number of other miscellaneous items of public expenditure also need to be included, such as capital grants and net lending by government (which is affected by privatisation proceeds). On the receipts side, we have not modelled capital taxes and other miscellaneous items such as profits, rents, royalties and interest receipts. Some stylised equations are used to determine these elements in our forecasting model, but these do not change the essential features of our analysis of the medium-term evolution of public finances.

III. ANALYSING PUBLIC FINANCES

A key feature of the model we have set out in this paper is that there is no *automatic* tendency for public borrowing to fall as the economy grows over the medium term. It is therefore misleading for policymakers to talk in terms of a 'growth dividend' which pays for tax cuts. There may be some modest 'fiscal drag' in the tax system which arises from the fact that tax allowances are indexed to prices rather than to wages. There may also be other shifts in the structure of income and spending in the economy that result in tax receipts rising more rapidly than GDP for a while. But over the medium term, our tax equations imply that receipts will rise in line with the tax base, unless there are changes in tax rates or the structure of allowances. Given that most of these tax bases (wages, consumption, profits, etc.) will tend to follow the growth of money GDP over the medium term, this implies a broadly constant tax burden (receipts as a percentage

of national income), in the absence of policy changes, as the economy grows over time.

The same tendencies apply on the expenditure side of the financial account. If there is no change in the equilibrium level of unemployment, current public spending will rise in line with the trend growth of GDP. Government expenditure as a share of national output will tend to fall in boom periods, but this apparent progress comes undone in recessions.[7] The experience of the late 1980s shows the problems that ensue if a cyclical improvement in public finances is used to finance a programme of tax cuts. The tax-cutting Budgets of 1986–89 went far beyond anything that was justified by the underlying control of public spending. Only by covertly clawing back the benefits of the tax give-aways of the late 1980s — in the form of reduced tax allowances, higher indirect taxes and higher National Insurance contributions — has it been possible to restore some order to public finances during 1994 and 1995. The new Labour government has built on this with (covert) tax increases of its own — changing the tax treatment of pension funds and bringing in a windfall tax on privatised utilities.

This tendency of current spending to rise in line with GDP over the long run is not set in stone. Before the mid-1970s, government expenditure rose more rapidly than national income. A resumption of that upward trend seems unlikely. Rather, recent discussion has focused on the ability of governments to set the public spending share of GDP on a declining trend. In the 1980s, the Conservative government did indeed claim that it had achieved such a reversal. However, these claims rested solely on cuts in capital spending, the short-term benefits of sales of physical and financial assets and cyclical swings in the ratio of current spending to national income.

It is certainly possible to envisage policy changes redefining the scope of the public sector that would change the historic relationship between public spending and GDP. However, the most significant steps that have been taken in this area — relating to pensions provision — will only have an effect over a very long time horizon. Radical changes in the scope of the Welfare State seem unlikely to change the outlook for public finances over a five- to 10-year time horizon. In the absence of such changes, governments will be reliant on further cuts in capital spending to achieve a sustained reduction in the public spending share of GDP or an improvement in labour market performance that allows the economy to sustain a lower equilibrium unemployment rate.

Another feature of our model is the sensitivity of public finances to the state of the cycle. But there is a twist to this story. It is not just the fact that there was a boom in the late 1980s that caused such a dramatic improvement in public

[7]It is possible that there will be a ratchet effect (hysteresis) and governments will find it harder to cut spending in recoveries than to increase it in recessions, leading to an increase in the public spending share of national output over the cycle. Our results do not support this view in that we find that the ratio between current public spending and trend GDP has been stable since the mid-1970s, once we allow for the effect of unemployment on social security payments.

TABLE 3

Public Finances: Impact of a 1 Percentage Point 'Cyclical' Rise in GDP (cumulative effect as a percentage of GDP)

	Government spending	*Tax receipts*	*PSBR*
LBS: consumer-led			
Year 1	–0.36	+0.10	–0.46
Year 2	–0.34	+0.43	–0.77
Year 3	–0.48	+0.41	–0.89
LBS: Export-led			
Year 1	–0.36	–0.09	–0.27
Year 2	–0.41	–0.09	–0.32
Year 3	–0.48	—	–0.48
Treasury			
Year 1	–0.40	+0.10	–0.50
Year 2	–0.55	+0.25	–0.80

finances. It was the fact that this boom was led by consumer spending, which contributed to such a rapid reduction in the PSBR. Table 3 shows the effect of a cyclical rise in GDP on public finances arising from two sources: a rise in consumption, due to a fall in the savings ratio, and a rise in exports, generated by higher world GDP. In each case, the simulation has been conducted so as to generate an immediate and sustained 1 per cent increase in GDP. The simulations are conducted with monetary policy set to keep inflation broadly steady, using an inflation control rule developed for the LBS model (see Nixon and Hall (1996)).[8] In both cases, there is a fall in the share of government spending in GDP, reflecting the cyclical nature of the public spending / GDP ratio. (We are assuming the trend growth of GDP and hence public spending has not changed.) But the effects through the tax system are very different in the two scenarios.

Higher consumer spending causes VAT and excise duties to rise, whereas there is no equivalent indirect tax boost from higher exports. Export-led growth does raise consumption as multiplier effects feed through, but much less significantly than in the other scenario. Indeed, as monetary policy is tightened to combat the inflationary impact of higher output, a strengthening exchange rate squeezes exports and boosts import volumes. As a result, a rise of over 2 per cent in consumption is required to produce a 1 percentage point rise in real GDP. In addition, our system of equations indicates that a fall in the savings ratio (which

[8]The control rule mimics the current approach to monetary policy, with interest rates being adjusted in response to deviations of inflation from a target rate.

generates the increase in consumer spending in our scenario) causes VAT receipts to rise more rapidly than consumer spending.

Export-led growth causes a larger rise in corporation tax receipts than consumption-led growth. But the impact of this improvement in corporate tax revenues is modest by comparison with the increased VAT and other consumption taxes generated by strong consumer spending. As a consequence, the PSBR ratio falls by 0.4 per cent of GDP more in response to a 1 per cent rise in output driven by consumption than in response to export-driven growth.

As a reference point, Table 3 also shows recent Treasury estimates of the cyclical nature of public borrowing (Virley and Hirst, 1995). These estimates are in line with the figures produced by our simulations for the impact on the PSBR of a consumer-led cyclical rise in output. This is not surprising as the Treasury estimates were based on the experience of the 1980s — a strongly consumer-led cycle. However, if the recovery is more strongly export-led, which was the case in the early years of the current expansion, our simulations indicate that the improvement in public finances will be less dramatic, which helps to explain the sluggishness of tax revenues in 1994 and 1995.

These findings suggest that simple estimates of the cyclical nature of public finances need to be treated with caution on two counts. First, if the cyclical impulse is overseas demand, the improvement in public finances is much less significant than if there is consumer-led growth. Second, a key component of the fall in the PSBR/GDP ratio stems from the failure of government spending to rise with GDP, causing a fall in the spending/GDP ratio, as Table 3 shows. If government spending rises with GDP, this element of the PSBR improvement will be wiped out. These two factors — together with other temporary influences, such as the impact of high privatisation proceeds and council house sales in 1988–89 — explain why the dramatic improvement in public finances in the late 1980s was not sustained. The fact that the cyclical recovery in the early 1990s was more strongly export-led also helps to explain why public finances did not improve as dramatically in the early years of the recovery as the government and other forecasters expected. Now that consumption is picking up more strongly, it is not surprising to see public borrowing falling more sharply than forecast.

IV. THE OUTLOOK FOR PUBLIC FINANCES

The latest projections in the government's Pre-Budget Report show the PSBR falling sharply from £22.6 billion (3 per cent of GDP) in 1996–97 to £9.5 billion in the current financial year (1997–98) and just £4.5 billion in 1998–99. However, our own assessment is that this view of the short-term outlook for public finances is too pessimistic. The November 1997 London Business School forecast (London Business School, 1997) suggested that the PSBR would fall more sharply in 1998–99, dropping to just £1.3 billion, despite the fact that our forecast of

economic growth next year is more subdued than the official projection.[9] This reflects the fact that our model suggests a strong boost to revenues from the consumer-led upturn that is currently under way, for the reasons outlined in the previous section.

However, looking to the medium term, official projections of public borrowing still look too optimistic. The July 1997 Budget set out medium-term projections for the period 1999–2000 to 2001–02 on three different assumptions for real public spending growth over the second half of the Parliament: 0.75 per cent per annum, 1.5 per cent per annum and 2.25 per cent per annum. In the light of our modelling of public expenditure trends, only the last of these three figures appears remotely realistic. Public spending is currently being squeezed tightly to bring down public borrowing, with total government expenditure (excluding privatisation proceeds) set to rise by just 2.6 per cent a year in cash terms between 1996–97 and 1998–99 — roughly in line with the rate of inflation. Even though some of this squeeze is being achieved by moving capital spending off the balance sheet through the Private Finance Initiative (PFI), this period of restraint involves holding the growth of public spending well below its long-run real growth rate of just over 2 per cent. It will be hard to resist pressures for some 'catch-up' after this period of restraint and keeping the growth of public spending to just over 2 per cent in the second half of the Parliament is likely to prove demanding. And yet this is the highest figure that the Treasury has included in its range of projections.

Figure 4 compares this 'pessimistic' official scenario with two projections produced using the LBS model of public finances: our central forecast and a more extreme scenario when the economy goes through a more pronounced cycle, with stronger growth in 1998 but weaker performance in 1999 and 2000.[10] Both LBS scenarios are more pessimistic than the Treasury over the medium term. In the boom–bust scenario, public finances move into surplus next year but the improvement is reversed in future years as the economy weakens. By contrast, the Treasury projections suggest that public finances are headed for surplus under current policies, even if public spending is at the top end of its estimates. (If public spending grows by just 0.75 per cent a year, then the Treasury projects that the surplus will grow to over 2 per cent of GDP by 2001–02.) Our projections are for public finances to remain in deficit over the medium term, though the deficit is quite sustainable — at less than 1 per cent of GDP. This reflects the steps taken under both the last government and the current government to raise additional revenue over the medium term.[11]

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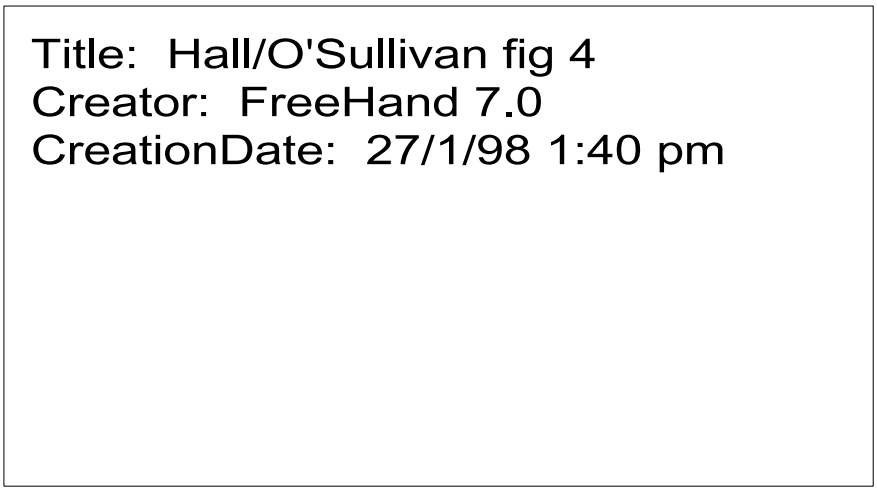
[9]The November 1997 LBS forecast projects GDP growth of just 2.0 per cent in 1998, compared with a forecast range of 2¼–2¾ per cent in the Pre-Budget Report.

[10]GDP growth in this scenario is stronger than the central forecast in 1998 (2.7 per cent compared with 2.0 per cent) but weaker in 1999 and 2000 (0.8 per cent and 1.9 per cent compared with 2.1 per cent and 2.6 per cent).

[11]The key measures were the abolition of profit-related pay and restriction of capital allowances on long-life assets in the November 1996 Budget, and the restriction of tax relief to pension funds in the July 1997 Budget. Recent Budget plans have also been based on the assumption that excise duties on tobacco and petrol will continue to rise

FIGURE 4

PSBR Projections as a Percentage of GDP



Source: *LBS Economic Outlook*, London Business School, November 1997.

There are two reasons for these discrepancies between our own assessment and the official view of the outlook for public finances. First, as consumer spending weakens in 1999 and 2000, we expect the boost to public finances from the current period of consumer-led growth to unwind to some degree. Second, the outlook for public spending implied by our model results in a stronger profile for public spending than even the highest of the Treasury projections. This analysis suggests that the government should err on the side of caution in framing its tax plans. There is still a danger of a repeat of the problems of forecasting and control of public finances that we saw in the late 1980s and early 1990s — albeit on a smaller scale. And the likelihood that public finances are likely to improve significantly in the short term adds to the risk of an excessive relaxation of fiscal policy in the run-up to the next election which would then need to be reversed.

V. CONCLUSIONS

The analysis we have presented in this paper suggests that medium-term projections of public sector borrowing need to take account of two key features of the relationship between public finances and the level of economic activity. First,

in real terms, which also helps to strengthen public finances over the medium term. A lower equilibrium unemployment rate (5–6 per cent in our forecast) also helps the medium-term outlook for public finances.

current public expenditure tends to rise in line with GDP growth, once allowance is made for cyclical effects and shifts in the equilibrium unemployment rate. Unless this tendency of public spending changes, the only levers available to cut public spending as a share of GDP are measures that reduce the equilibrium unemployment rate or further cuts in capital spending. (Interestingly, the new government is operating on both fronts, hoping to reduce equilibrium unemployment by Welfare to Work and shifting capital spending off the balance sheet through the Private Finance Initiative.)

Second, the responsiveness of tax receipts to economic growth over the cycle depends on whether swings in economic activity are consumer-led or export-led. A consumption-driven cycle, such as we saw in the late 1980s and early 1990s, is likely to produce a larger cyclical improvement in public finances, followed by a more rapid deterioration. Given that the current upswing in the UK economy is being driven by consumer spending, this suggests that this year and next will see a rapid improvement in public finances. However, this cyclical movement is likely to exaggerate the extent of any underlying improvement in public finances. It does not provide the basis for a significant relaxation of fiscal policy in the second half of the current Parliament.

APPENDIX: MODELLING GOVERNMENT EXPENDITURE

In our models of public expenditure, the dependent variable is the ratio of the spending variable to GDP, implicitly imposing a unit coefficient on the spending variable with respect to GDP. In the model for government consumption, we expect *GR* (the ratio of current expenditure on goods and services to GDP) to be stationary allowing for the effect of the cycle, captured by *GAP* (the difference between the log of real GDP and its trend value). It is necessary to allow for the cycle because, whilst we expect government spending to rise with GDP in the long run, it is much more stable than national output in the short run.

To explain government grants to the personal sector — the bulk of which are accounted for by social security payments — we construct a variable *SSR* which expresses grants to the personal sector as a percentage of GDP. In the social security expenditure model, we expect *SSR* to be stationary, allowing for the cycle (*GAP*) and the unemployment rate (*U*). We also include *RELP*, the ratio of the retail price index to RPIX, the retail price index excluding mortgage payments.

In estimating models for these two key expenditure variables, we test for cointegration using the Johansen procedure. This requires starting from a very general VAR model, and reducing to a more parsimonious model with fewer lags, using appropriate model selection criteria. We also consider the possibility that the effects of discretionary policy shifts will require the use of dummy variables, particularly around the time of general elections.

1. Government Consumption

Our model of government consumption of goods and services explains current consumption, deflated by the GDP deflator, (*G*) in terms of GDP and trend GDP. Our procedure was to test for cointegration between the ratio of *G* to real GDP (*GR*) and the difference between actual and trend GDP (constructed by regressing log GDP on a linear trend over the period 1975Q1 to 1994Q3, giving a trend growth rate of 2.14 per cent per annum). A lag length of two periods is chosen — the shortest lag length consistent with eliminating fourth-order serial correlation in the VAR — and dummy variables for outlying quarters are included as I(0) variables. The results of the Johansen maximum eigenvalue test are presented in Table A.1.

These results strongly suggest the existence of one cointegrating vector. The Johansen procedure gives estimated values for this cointegrating vector, which are used to construct the error correction term, *GECM*. The estimated loading weight is –0.36804. Reparameterising the model and including the error correction term derived from the Johansen estimation allows us to derive the final model. Standard t-tests for parameter significance are given in parentheses below the coefficients.

$$
\begin{aligned}
\Delta G = {} & \Delta GDP(-1) - \underset{(4.7)}{0.57} - \underset{(1.9)}{0.23}\,\Delta GR(-1) - \underset{(4.7)}{1.00}\,\Delta GAP(-1) \\
& - \underset{(4.7)}{0.37}\,GECM(-2) + \underset{(4.1)}{0.055}\,D76Q2 - \underset{(2.3)}{0.029}\,D79Q2 \\
& - \underset{(2.0)}{0.28}\,D79Q2(-1) - \underset{(3.0)}{0.037}\,D85Q2
\end{aligned}
$$

TABLE A.1

Cointegration Analysis: Government Spending on Goods and Services

I(1) variables: *GR, GAP*.
I(0) variables: *D76Q2, D79Q2, D79Q2*(–1), *D85Q2*.

Null	*Alternative*	*Statistic*	*95% critical value*	*90% critical value*
$r = 0$	$r = 1$	23.3728	14.0690	12.0710
$r = 1$	$r = 2$	1.8548	3.7620	2.6870

$GECM = GR + 1.0598\ GAP$

where *GR* is the log of the ratio of government consumption to GDP and *GAP* is the difference between (log) GDP and (log) trend GDP.

Sample (75 observations): 1976Q1 to 1994Q3

$\bar{R}^2$:		0.40812
SE regression:		0.01230
Serial correlation	c^2 (4):	5.0776
Functional form	c^2 (1):	0.8857
Normality	c^2 (2):	1.3723
Heteroscedasticity	c^2 (1):	0.2430

2. Government Grants to the Personal Sector

The structure of our equation explaining government grants is similar to that for spending on goods and services, though we include more dummies to capture political influences, as well as the effect of the unemployment rate (*U*) and the difference between RPI inflation and underlying inflation (*RELP*). In two periods, social security spending deviated from its long-run relationship: 1978–79 and 1992–94. The first period (captured by the dummy variable *LABG*) represents a period during which public spending limits were relaxed in the run-up to an election, allowing some catch-up of benefit levels following a period of spending restraint. The new Conservative administration reversed this upward shift. The strong growth of social security payments in 1992–94 also accompanied a period of public spending relaxation. This expansion (captured by the dummy variable *INVB*) may also reflect some rise in 'hidden unemployment' as the invalidity benefit regime was relaxed and absorbed some of the long-term unemployed.

As with the government consumption model, we test for cointegration using the Johansen maximum likelihood procedure. A lag length of three periods is chosen using the same model selection criterion. The results are presented in Table A.2.

TABLE A.2

Cointegration Analysis: Grants to Personal Sector

I(1) variables: *SSR, GAP, U, RELP*.
I(0) variables: *LABG, INVB, D83Q1*.

Null	*Alternative*	*Statistic*	*95% critical value*	*90% critical value*
$r = 0$	$r = 1$	36.1549	27.0670	24.7340
$r = 1$	$r = 2$	22.7686	20.9670	18.5980
$r = 2$	$r = 3$	8.9051	14.0690	12.0710
$r = 3$	$r = 4$	0.7073	3.7620	2.6870

SSR is the (log) ratio of social security payments (government grants to the personal sector) to GDP, *U* is the unemployment rate and *RELP* is the (log) ratio of RPI to RPIX. Two cointegration vectors are identified by this test. The corresponding error correction terms are given here:

$$SSECM1 = SSR + 1.82\ GAP - 0.027\ U - 2.33\ RELP;$$

$$SSECM2 = SSR + 0.24\ GAP - 0.047\ U + 0.80\ RELP.$$

As with the model for government consumption, the error correction terms are included in the reparameterised equation. Straightforward t-tests show that *SSECM2* and logged changes in *RELP* are insignificant, and so they are excluded from the final model listed below. Again, standard t-tests for parameter significance are given in parentheses below the coefficients.

$$\begin{aligned}\Delta SSR = &- \underset{(5.2)}{0.92} - \underset{(6.0)}{0.66}\ \Delta SSR(-1) - \underset{(4.8)}{0.87}\ \Delta GAP(-1) \\ &+ \underset{(5.1)}{0.031}\ \Delta U(-1) - \underset{(5.3)}{0.40}\ SSECM1(-2) + \underset{(5.1)}{0.035}\ LABG \\ &- \underset{(3.9)}{0.052}\ D83Q1 - \underset{(4.2)}{0.024}\ INVB\end{aligned}$$

Sample (75 observations):		1976Q1 to 1994Q3
$\bar{R}^2$:		0.64158
SE regression:		0.01297
Serial correlation	$c^2(4)$:	1.2424
Functional form	$c^2(1)$:	0.2182
Normality	$c^2(2)$:	0.1187
Heteroscedasticity	$c^2(1)$:	1.7978

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